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REMARKS

Claims 1, 3-8, 11, 13, 15, and 19-23 were pending in the Application prior to the outstanding Office Action. In the Office Action, claims 1, 3-8, 11, 13 and 19-23 were rejected under 35 U.S.C. §112, second paragraph. Claims 1, 3-8, 11-15, and 19-23, were rejected under 35 U.S.C. §103(a). Applicants have canceled claims 19-23 and therefore, the Examiner's rejections of claims 19-23 are not addressed in this Response.

I. RESPONSE TO REJECTIONS UNDER 35 U.S.C. §112, SECOND PARAGRAPH

In paragraph 3 of the Office Action mailed April 23, 2004, the Examiner rejected claims 1, 3-8, 11, 13 and 19-23 under 35 U.S.C. §112, second paragraph.

A. Independent Claim 1

The Examiner rejected claim 1 because "it is unclear as to how ... the rotational drive [is] housed within a base." Applicants have amended claim 1 to clarify that the "rotational drive [is] mounted to said base." Amended claim 1 meets the requirements set forth under 35 U.S.C. §112, second paragraph.

B. Dependent Claim 3

The Examiner rejected claim 3 as depending from canceled claim 2. Applicants have amended claim 3 to depend from claim 1. Amended claim 3 meets the requirements set forth under 35 U.S.C. §112, second paragraph.

C. Dependent Claims 4-8

Dependent claims 4-8 depend directly or indirectly from independent claim 1. These dependent claims include all of the limitations of the independent claim from which they depend. Applicants respectfully assert that dependent claims 4-8 are allowable for at least the reasons set forth above concerning independent claim 1.

D. Independent Claim 11

The Examiner rejected claim 11 because "it is unclear how ... a rotational drive [is] seated within a bore." Applicants have amended claim 11 to clarify that the "rotational drive [is] mounted to said base." Amended claim 11 meets the requirements set forth under 35 U.S.C. §112, second paragraph.

E. Dependent Claim 13

Dependent claim 13 depend directly or indirectly from independent claim 11. This dependent claim includes all of the limitations of the independent claim from which it depends. Applicants respectfully assert that dependent claim 13 is allowable for at least the reasons set forth above concerning independent claim 11.

II. RESPONSE TO REJECTIONS UNDER 35 U.S.C. §103(a)

In paragraphs 5-8 of the Office Action mailed April 23, 2004, the Examiner rejected claims 1, 3-8, 11-15 and 19-23 under 35 U.S.C. §103(a) as being unpatentable over several combinations of the following patents:

- U.S. Patent No. 5,928,390 issued to Yaegashi et al. ("*Yaegashi*");
- U.S. Patent No. 6,099,643 issued to Ohtani et al. ("*Ohtani*");
- U.S. Patent No. 5,794,487 issued to Solomon et al. ("*Solomon*"); and
- U.S. Patent No. 4,770,590 issued to Hugues et al. ("*Hugues*").

Fig. 1 of *Yaegashi* illustrates "a vertically movable main wafer transfer mechanism 21 [that] is provided in a central part of the process station 20." *Yaegashi*, 6: 11-13. "The main wafer transfer mechanism 21 has a columnar support body 70 comprising a pair of mutually facing vertical wall portion 71 and 72 coupled to each other at their upper and lower ends." *Yaegashi*, 9: 49-52; Fig. 7. The lower end of the body 70 "is coupled to a rotary shaft of a rotational drive motor 74." *Yaegashi*, 9: 54-56. A rotational shaft 70a, extending from the upper end of the body 70, is secured to the station frame. The support body 70 pivots about a theta-axis, which is defined by the longitudinal central axis of the rotational shaft 70a and rotary shaft of the motor 74. "A wafer transfer member 73 is disposed inside the support body 70 so as to be vertically movable (in direction Z)." *Yaegashi*, 9: 52-54.

Ohtani describes two substrate transport robots - TC and TH. Robot TC includes "an X-direction driving mechanism 30, a Z-direction (vertical) driving mechanism 30, a rotation mechanism 40 and an arm sliding mechanism 50." *Ohtani*, 8:7-10. Robot TH is similar to robot TC. The X-direction driving mechanisms "are adapted to move the robots TC and TH on rails along the X direction." *Ohtani*, 8:14-15. The Z-direction driving mechanisms "utilize stretch

driving of a pantagraph structure.” *Ohtani*, 8: 18-19. The rotation mechanisms and the arm sliding mechanisms “are adapted to rotate arms of the substrate transport robots TC and TH in horizontal planes and advancing/retreating the arms respectively.” *Ohtani*, 8: 19-21.

Solomon describes a drive system for a conventional dual-link robotic arm 24. The robotic arm 24 has “a lower arm link 26, an upper arm link 28, and a hand or end effector 30.” *Solomon*, 3: 9-11. In the Fig. 3 embodiment, each arm link 26, 28 includes “a high-density metallic or ceramic filter 170,172 ... mounted in the bottom wall 26’ of the arm link or arm ‘hub’.” *Solomon*, 6: 45-47. The filters “provide a dense barrier against entry or exit of particles from the arm links.” *Solomon*, 6: 47-48.

Hugues describes a wafer transfer module mechanism 29 that includes a paddle 33 to pick up and carry a wafer 35. The mechanism itself 29 is stationary. However, the paddle 33 “is movable in a vertical (Z) direction and in a radial (R) direction and in a rotational (theta) direction.” *Hugues*, 4: 49-51.

Yaegashi in view of Ohtani

In the Office Action, the Examiner rejected claims 1, 3-6 and 11-15 under 35 U.S.C. 103(a) as being unpatentable over *Yaegashi* in view of *Ohtani*.

A. Independent Claim 1 Patently Distinguishes over *Yaegashi* in view of *Ohtani*

Claim 1, among other things, recites:

- “a rotational drive mounted to said base and affixed to said first end of said support column, said rotational drive adapted to rotate said support column about a longitudinal central axis of said support column, said longitudinal central axis defining a theta axis;
- a z-axis drive housing having a base portion and an elongated body, said base portion mounted to said second end of said support column such that said rotational drive rotates said z-axis drive housing about said theta axis;
- a z-axis drive assembly housed substantially within said elongated body, said z-axis drive assembly adapted to move between a first position and a second position along a second linear path, said second linear path defining a z-axis that is offset from said theta axis;”

The z-axis disclosed in *Yaegashi* is not “offset from said theta axis.” In contrast, *Yaegashi* discloses that the theta axis is concentric with the z-axis. The end effector motion for inserting and removing wafers into and out of, for example, a FOUP, has the highest duty cycle and requires the longest overall distance to travel. The wafer engine recited in claim 1, which

offsets the z-axis from the theta axis, provides several advantages over the wafer transfer mechanism 21 disclosed in *Yaegashi*. For example, when the wafer engine recited in claim 1 rotates to face a wafer, the end effector is closer to the wafer by a distance equal to the spacing between the theta axis and the z-axis. Thus, the end effectors of the robot 21 in *Yaegashi* will have to travel a further distance to pick up a wafer than the wafer engine recited in claim 1. This extra distance increases the moving mass of the robot 21, the motion time to pick up a wafer and the wear of the robot 21. Therefore, the wafer engine recited in claim 1 is not obvious over *Yaegashi*.

Moreover, *Ohtani* does not provide the elements missing in *Yaegashi*. Fig. 10 in *Ohtani* illustrates that the Z-direction (vertical) driving mechanisms 30 of the substrate transfer robots TC and TH move vertically along a z-axis that is concentric with the theta axis. The robot in *Ohtani* therefore has the same disadvantages as the robot 21 in *Yaegashi*. Therefore, Applicants respectfully suggest that the wafer engine recited in claim 1 is not obvious over *Yaegashi* in view of *Ohtani*.

B. Dependent Claims 3-6 Patently Distinguish over *Yaegashi* in view of *Ohtani*

Dependent claims 3-6 depend directly or indirectly from independent claim 1. These dependent claims include all of the limitations of the independent claim from which they depend. Applicants respectfully assert that dependent claims 3-6 are allowable for at least the reasons set forth above concerning independent claim 1.

C. Independent Claim 11 Patently Distinguishes over *Yaegashi* in view of *Ohtani*

Claim 11, among other things, recites:

- “a rotational drive mounted to said base and affixed to said first end of said support column, said rotational drive adapted to rotate said support column about a longitudinal central axis of said support column, said longitudinal central axis defining a theta-axis;
- a z-axis drive housing having an elongated vertical body and a base portion extending substantially perpendicular from said elongated vertical body and affixed to said second end of said support column, said z-axis drive housing containing a z-axis drive assembly adapted to move within said elongated vertical body along a second linear path, said second linear path defining a z-axis that is offset from and substantially parallel to said theta-axis;”

The z-axis disclosed in *Yaegashi* is not “offset from and substantially parallel to said theta axis.” Moreover, *Ohtani* does not provide the elements missing in *Yaegashi*. For at least the same reasons discussed above with regard to claim 1, the wafer engine recited in claim 11 is not obvious over *Yaegashi* in view of *Ohtani*.

D. Dependent Claim 13 Patently Distinguishes over *Yaegashi* in view of *Ohtani*

Dependent claim 13 depends directly or indirectly from independent claim 11. This dependent claim includes all of the limitations of the independent claim from which it depends. Applicants respectfully assert that dependent claim 13 is allowable for at least the reasons set forth above concerning independent claim 11.

E. Independent Claim 15 Patently Distinguishes over *Yaegashi* in view of *Ohtani*

Claim 15, among other things, recites:

“means for moving said slide body between a third position and a fourth position along a vertical linear path, said vertical linear path defining a z-axis;
means for simultaneously rotating said slide body and said means for moving said slide body between a third and fourth position about a theta axis that is offset from said z-axis; and”

The theta axis disclosed in *Yaegashi* is not “offset from said z-axis.” Moreover, *Ohtani* does not provide the elements missing in *Yaegashi*. For at least the same reasons discussed above with regard to claim 1, the wafer engine recited in claim 15 is not obvious over *Yaegashi* in view of *Ohtani*.

Yaegashi* in view of *Solomon

In the Office Action, the Examiner rejected claim 15 under 35 U.S.C. 103(a) as being unpatentable over *Yaegashi* in view of *Solomon*. Claim 15, among other things, recites:

“means for moving said slide body between a third position and a fourth position along a vertical linear path, said vertical linear path defining a z-axis;
means for simultaneously rotating said slide body and said means for moving said slide body between a third and fourth position about a theta axis that is offset from said z-axis; and”

As previously discussed above, the theta axis disclosed in *Yaegashi* is not “offset from said z-axis” and therefore, the wafer engine recited in claim 15 is not obvious in view of *Yaegashi*. Moreover, *Solomon* does not provide the elements missing in *Yaegashi*. *Solomon* discloses a conventional dual link robot arm. The wafer engine recited in claim 15 provides

several advantages over the robot arm disclosed in *Solomon*. For example, a dual link robot arm requires a large amount of space to rotate within. The wafer engine recited in claim 15 achieves a much tighter turning radius. Thus, a processing tool containing the wafer engine will have a greatly reduced footprint. Therefore, Applicants respectfully assert that the wafer engine recited in claim 15 is not obvious over *Yaegashi* in view of *Solomon*.

Yaegashi in view Ohtani and further in view of Hugues

In the Office Action, the Examiner rejected claims 7 and 13 under 35 U.S.C. 103(a) as being unpatentable over *Yaegashi* in view *Ohtani* and further in view of *Hugues*.

A. Dependent Claim 7 Patently Distinguishes over *Yaegashi* in view of *Ohtani* and further in view of *Hugues*

Dependent claim 7 depends indirectly from independent claim 1. Claim 1, among other things, recites:

- “a rotational drive mounted to said base and affixed to said first end of said support column, said rotational drive adapted to rotate said support column about a longitudinal central axis of said support column, said longitudinal central axis defining a theta axis;
- a z-axis drive housing having a base portion and an elongated body, said base portion mounted to said second end of said support column such that said rotational drive rotates said z-axis drive housing about said theta axis;
- a z-axis drive assembly housed substantially within said elongated body, said z-axis drive assembly adapted to move between a first position and a second position along a second linear path, said second linear path defining a z-axis that is offset from said theta axis;”

For at least the same reasons discussed above with regard to claim 1, Applicants respectfully assert that claim 7 is not obvious over *Yaegashi* in view of *Ohtani*. Moreover, *Hugues* does not provide the elements missing in *Yaegashi* and *Ohtani*. The theta drive 97 (“rotational drive”) in *Hugues* does not rotate the z drive 107. The theta drive 97 only rotates the paddle 33. *Hugues* does not rotate “said z-axis drive housing about said theta axis.” Therefore, Applicants respectfully suggest that the wafer engine recited in claim 7 is not obvious over *Yaegashi* in view *Ohtani* and further in view of *Hugues*.

B. Dependent Claim 13 Patently Distinguishes over *Yaegashi* in view of *Ohtani* and further in view of *Hugues*

Dependent claim 13 directly from independent claim 11. Claim 11, among other things, recites:

- “a rotational drive mounted to said base and affixed to said first end of said support column, said rotational drive adapted to rotate said support column about a longitudinal central axis of said support column, said longitudinal central axis defining a theta-axis;
- a z-axis drive housing having an elongated vertical body and a base portion extending substantially perpendicular from said elongated vertical body and affixed to said second end of said support column, said z-axis drive housing containing a z-axis drive assembly adapted to move within said elongated vertical body along a second linear path, said second linear path defining a z-axis that is offset from and substantially parallel to said theta-axis;”

For at least the same reasons discussed above with regard to claim 7, Applicants respectfully assert that claim 7 is not obvious over *Yaegashi* in view of *Ohtani* and further in view of *Hugues*.

Yaegashi* in view of *Ohtani* and further in view of *Solomon

In the Office Action, the Examiner rejected claims 8 and 19-23 under 35 U.S.C. 103(a) as being unpatentable over *Yaegashi* in view of *Ohtani* and further in view of *Solomon*. Dependent Claim 8 depends directly from independent claim 1. Claim 1, among other things, recites:

- “a rotational drive mounted to said base and affixed to said first end of said support column, said rotational drive adapted to rotate said support column about a longitudinal central axis of said support column, said longitudinal central axis defining a theta axis;
- a z-axis drive housing having a base portion and an elongated body, said base portion mounted to said second end of said support column such that said rotational drive rotates said z-axis drive housing about said theta axis;
- a z-axis drive assembly housed substantially within said elongated body, said z-axis drive assembly adapted to move between a first position and a second position along a second linear path, said second linear path defining a z-axis that is offset from said theta axis;”

For at least the same reasons previously discussed above with regard to claim 1, the wafer engine recited in claim 8 is not obvious over *Yaegashi* in view of *Ohtani*. Moreover, *Solomon* does not provide the elements missing in the combination of *Yaegashi* and *Ohtani*. *Solomon*

describes a dual-link robot arm. One skilled in the art would not combine a dual-link robot arm with the robot 21 disclosed in *Yaegashi*. Therefore, Applicants respectfully assert that the wafer engine recited in claim 8 is not obvious over *Yaegashi* in view of *Ohtani* and further in view of *Solomon*.

Additional Remarks

The references cited by the Examiner but not relied upon have been reviewed, but are not believed to render the claims unpatentable, either singly or in combination.

In light of the above, it is respectfully submitted that all of the claims now pending in the subject patent application are allowable, and a Notice of Allowance is requested. The Examiner is respectfully requested to telephone the undersigned before an advisory action is issued in order to avoid any unnecessary filing of an appeal.

The Commissioner is authorized to charge any underpayment or credit any overpayment to Deposit Account No. 50-0639 for any matter in connection with this response, including any fee for extension of time, which may be required.

Respectfully submitted,

Date: 6.22.04

By: 

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SF1:552095.1



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| | |
|------------------|---------------------------|
| Title: | WAFER ENGINE |
| Inventor(s): | Anthony C. Bonora, et al. |
| Application No: | 10/087,400 |
| Filing Date: | March 1, 2002 |
| Atty Docket No: | 34741-773 |
| Due Date: | June 23, 2004 |
| Date of Mailing: | June 22, 2004 |

SDS/sm